PCT WORLD INTELLECTU Intel

INTERNATIONAL APPLICATION PUBLISHED

WO 9602921A1

(51) International Patent Classification 6 : H01B 13/00, 7/06 — A1

(11) International Publication Number: WO 96/02921

(43) International Publication Date: 1 February 1996 (01.02.96)

(21) International Application Number: PCT/GB95/01663

(22) International Filing Date: 14 July 1995 (14.07.95)

(30) Priority Data: 9414240.3 14 July 1994 (14.07.94) GB

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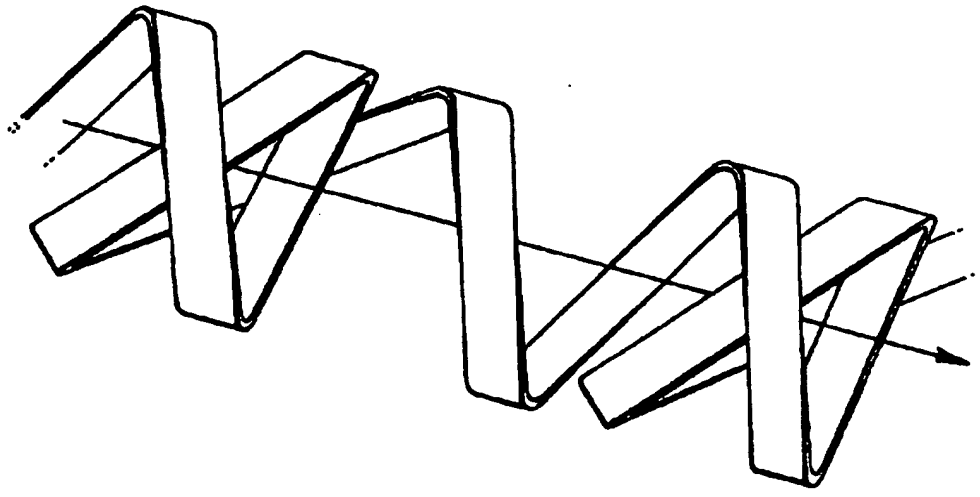
(81) Designated States: JP, US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Published

With international search report.

Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

(54) Title: METHOD OF COILING AND A COILED CONDUCTOR



(57) Abstract

Methods of coiling a conductor - for example a telephone cord - in a manner that imparts no net twist on the conductor, thus preventing the conductor from twisting or kinking. One technique involves coiling the conductor in one sense followed by a turn in the opposite sense. The conductor may adopt for example a helical structure or a planar structure. In a second technique, the conductor is twisted along its length concomitantly winding the twisted length in a generally helical path.

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METHOD OF COILING AND A COILED CONDUCTOR

This invention relates to the coiling of electrical conductors which serve as resiliently extensible electrical leads. The invention has particular application in preventing the unwanted twisting of helical telephone cords and the like.

The well known helical telephone cord has an inherent tendency to twist on itself and kink. This not only restricts its full functionality but manually untwisting the coiled cord repeatedly can be tiresome. Previous attempts to allay this problem have involved the use of additional elements which are attached to the helical cord in some way so as to prevent it from twisting. Such devices have served only to correct the symptoms and not to resolve the actual source of the problem.

The present invention provides methods for the coiling of a cord that address the cause of the problem of kinking. Furthermore, as this invention involves methods for manipulating simply the cord itself no additional elements are required.

Accordingly, the present invention consists in one aspect in a method of coiling an electrical conductor so as to provide a resiliently extensible lead, wherein additional turns of opposite axial sense are superimposed upon a generally helical coil structure such that no net twist is imparted to the conductor.

Advantageously, said additional turns are superimposed alternately with the generally helical coil structure.

In a further aspect, the present invention consists in an electrical conductor coiled so as to provide a resiliently extensible lead, wherein additional turns of opposite axial sense are superimposed upon a generally helical coil structure such that no net twist is imparted to the conductor.

Advantageously, said additional turns are superimposed alternately with the generally helical coil structure.

In another aspect of the present invention there is provided a method of

coiling an elongate electrical conductor so as to provide a resiliently extensible lead, comprising twisting the conductor along its length concomitantly with winding the twisted length in a generally helical path such that no net twist is imparted to the conductor.

In yet a further aspect, the present invention consists in an electrical conductor coiled so as to provide a resiliently extensible lead in such a manner that substantially no net twist is imparted in the coiling to the conductor.

The invention will now be described by way of example with reference to the accompanying drawings, in which:-

Figures 1(a) and (b) show a conventionally coiled cord;

Figure 1(c) depicts an ordinary telephone with a twisted cord;

Figure 2 illustrates one embodiment of a coiled cord according to one aspect of the present invention;

Figures 3(a), (b), (c) and (d) diagrammatically map out the steps for coiling the cord of Figure 2;

Figure 4 shows one cycle of the coil of Figure 2 to an enlarged scale;

Figure 5 shows a planar structure embodiment according to the first aspect of the present invention; and

Figure 6 shows another embodiment according to a further aspect of the present invention.

Referring initially to Figure 1(a), the coiling of the cord entails winding the cord in a circular motion while translating it along a linear path, thus producing a generally helical structure. Figure 1(a) shows a cord wound with the leading edge slanting in the forward direction. The two points on the cord labelled 5 and 6 represent one complete cycle of the cord, in a forward turn. If an axial force applied to points 5 and 6 pulls the two points apart, it can be seen from Figure 1(b) that the cord has turned through 360° and that a twist exists in the cord. Repeatedly coiling a cord in this way inadvertently loads a resultant twist over the length of the cord in the opposite direction to the coiling. The effect of this opposing twist is a tendency for the length of coiled cord to kink, as shown in Figure 1(c). This tendency is particularly troublesome where, as is usually

the case with a telephone cords, there is frequent extension and retraction of the cord.

Referring now to Figure 2, there is illustrated a telephone cord according to one aspect of the present invention. The coiling of the cord is again essentially a circular winding motion along a linear path, however, the exact manner of coiling, which may be termed "zero coiling", has a subtle but crucial difference which will now be described with the aid of Figures 3(a), (b), (c) and (d).

First of all it may be helpful to assume that the cord is to be wrapped around a transparent mandrel (10). The steps are then as follows. Figure 3(a): the cord (11) is pinched at one end and allowed to hang freely. Figure 3(b): the mandrel is held behind the top of the cord at an obtuse angle to it, the cord drapes over the mandrel and is smoothed under it and curled up to the top. Figure 3(c): here, instead of looping the cord down, under and up again, the cord is reversed in direction and tucked under the first drape, pulled through and then guided under the mandrel, around the back and over to the top again, Figure 3(d). This reverse turn is then followed by a single forward turn. Repeating this process of alternating a forward with a reverse turn gives a zero coiled cord.

The points labelled 7 and 8 in Figure 4 represent one complete cycle of a cord with one forward turn and one reverse turn. If an axial force is applied that pulls these two points apart it can be demonstrated that the coiled cord opens out into a long straight cord having no twists. Thus, over the length of the zero coiled cord there is no resultant twist and hence a much reduced inherent tendency to kink.

Figure 5 illustrates another embodiment of the first aspect of the present invention, in which the alternating forward and reverse turns of a conductor, rather than spiralling into a helical coil, form a generally planar structure with the axis of each turn, being transverse to the line of the conductor.

Turning to Figure 6, there is shown a coiled conductor according to a further aspect of the present invention. The conductor of this embodiment is

produced using a different method from that described above, but still results in the conductor having substantially no net twist. This method of coiling comprises a combination of essentially two steps which can be performed in reversible order or simultaneously. One step requires the conductor to be twisted along its own length; the other step entails winding the twisted conductor along a generally helical path. The effect of the twisting action being to counterbalance the residual twist induced by the winding action, thereby producing a cord with no net twist. It is apparent that the winding action of this method is the same as the winding action employed in producing known coiled conductors, and therefore this method readily lends itself to known machinery for the coiling of telephone cords or other extensible electrical leads. The additional twisting step could be implemented by a continually rotating element that feeds the length of conductor through to the winding machinery.

As will be understood, a variety of modifications can be made to the described techniques without departing from the scope of the invention. Thus, the reversed direction turns need not be interposed one-for-one; an alternative would be a repeating sequence of a few turns in one direction followed by an equal number in the opposite direction. In a more general, but less practicable case, there would be a random distribution of turns in respective opposite axial senses, such that over any significant length of the coiled lead, no net twist existed in the conductor.

CLAIMS

1. A method of coiling an electrical conductor to provide an extensible lead having a series of turns, in which turns in one sense are interposed with turns in the opposite sense so that no net twist is imparted to the conductor.

2. A method according to Claim 1, wherein additional turns of opposite axial sense are superimposed upon a generally helical coil structure.

3. A method according to Claim 1, wherein additional turns of opposite axial sense are superimposed upon a generally planar structure.

4. A method according to Claims 2 or 3, wherein said additional turns are superimposed alternately.

5. An electrical conductor formed so as to provide a resiliently extensible lead, wherein no net twist is imparted to the conductor.

6. A conductor according to Claim 5, wherein additional turns of opposite axial sense are superimposed upon a generally helical coil structure.

7. A conductor according to Claim 5, wherein additional turns of opposite axial sense are superimposed upon a generally planar structure.

8. A conductor according to Claims 6 or 7, wherein said additional turns are superimposed alternately.

9. An electrical conductor formed so as to provide a resiliently extensible lead in such a manner that substantially no net twist is imparted in the coiling to the conductor.

10. A method of coiling an elongate electrical conductor so as to provide a resiliently extensible lead, comprising twisting the conductor along its length concomitantly with winding the twisted length in a generally helical path such that no net twist is imparted to the conductor.

Fig.1a.

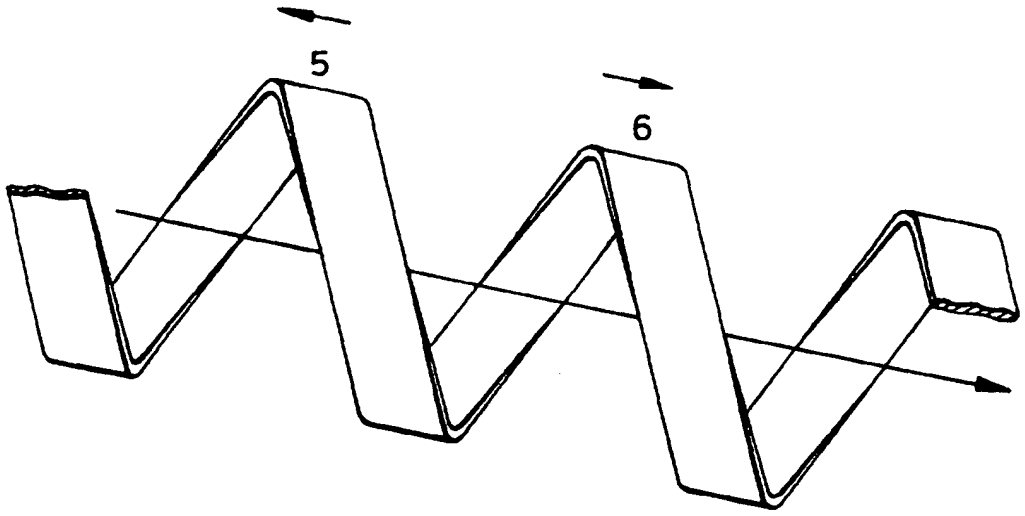


Fig.1b.

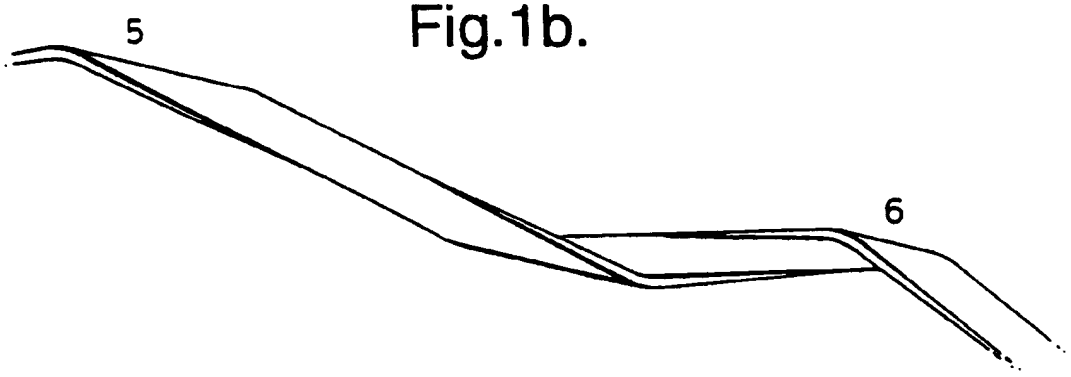


Fig.1c.

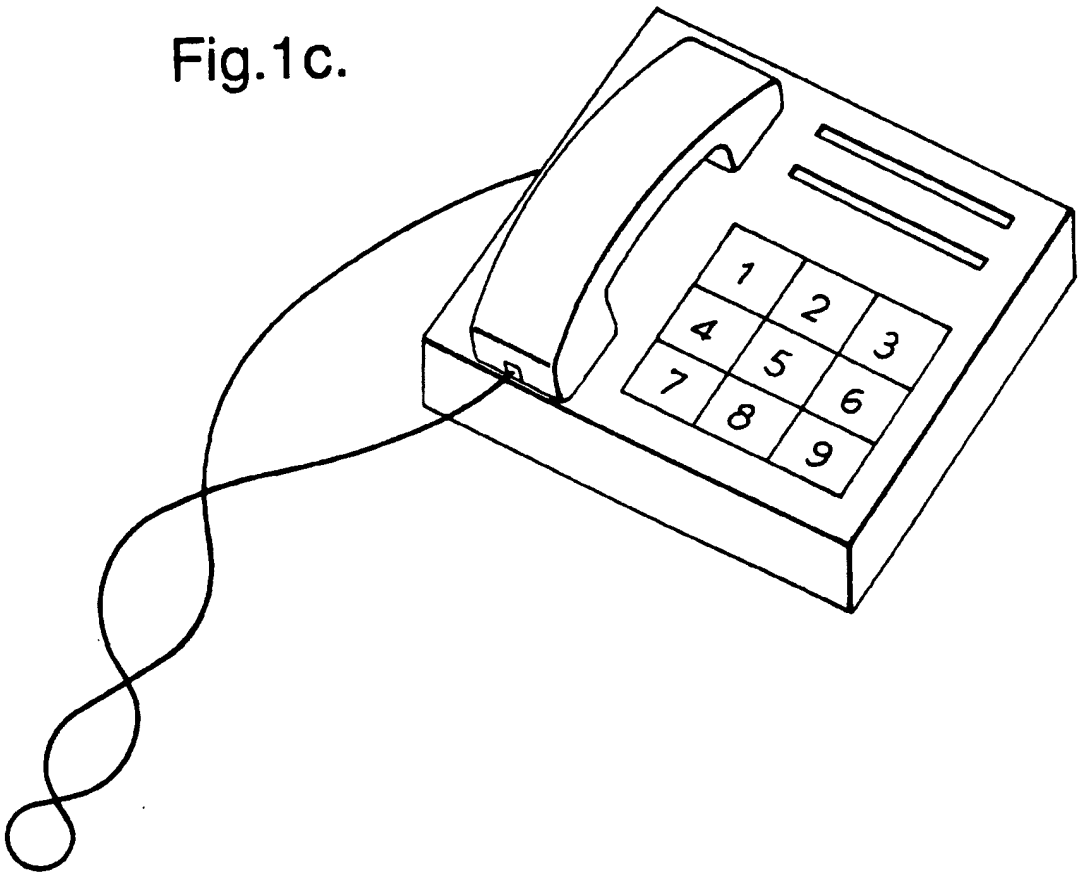


Fig.2.

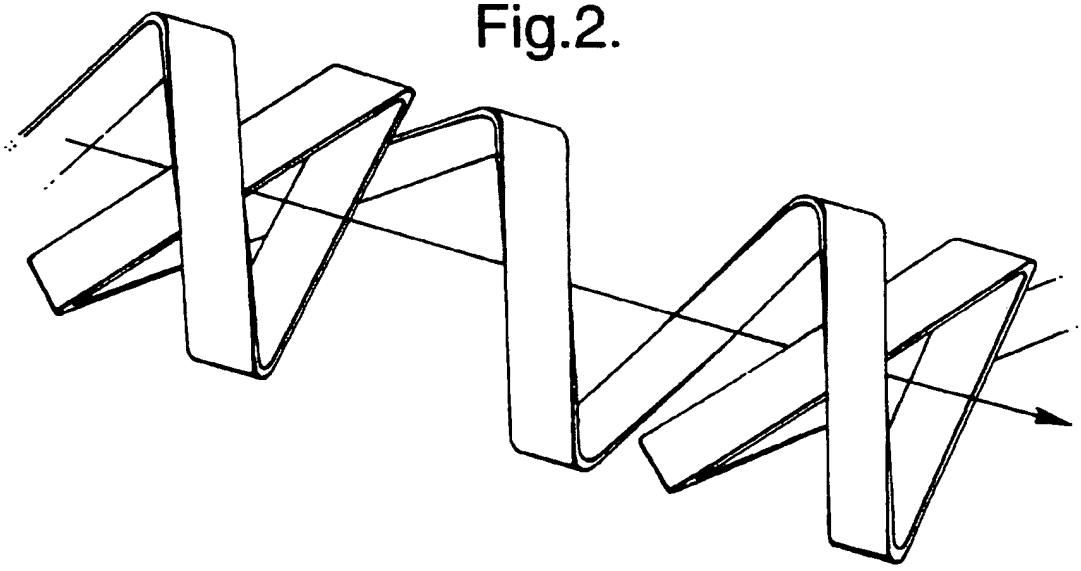
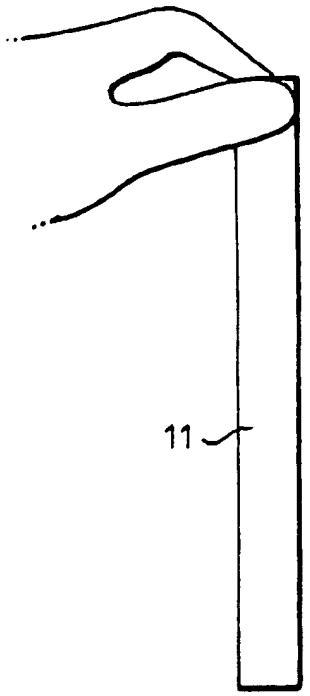


Fig.3a.



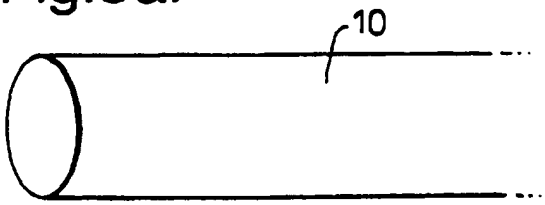


Fig.3b.

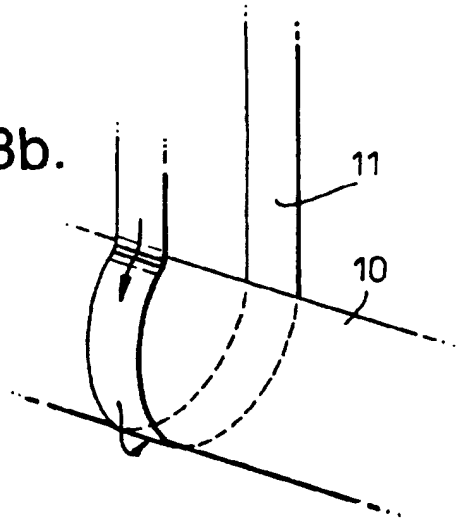


Fig.3c.

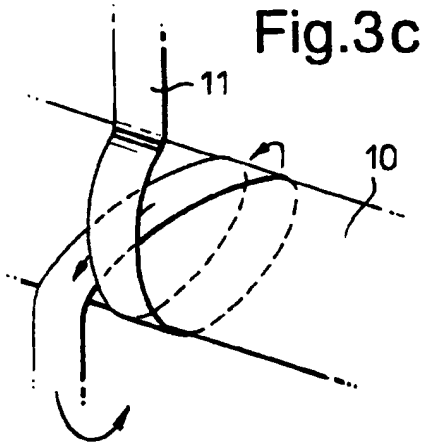


Fig.3d.

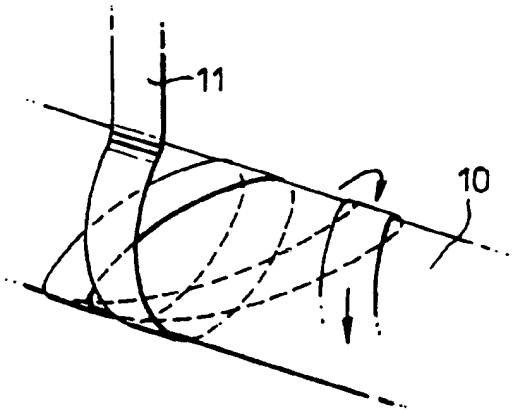


Fig.4.

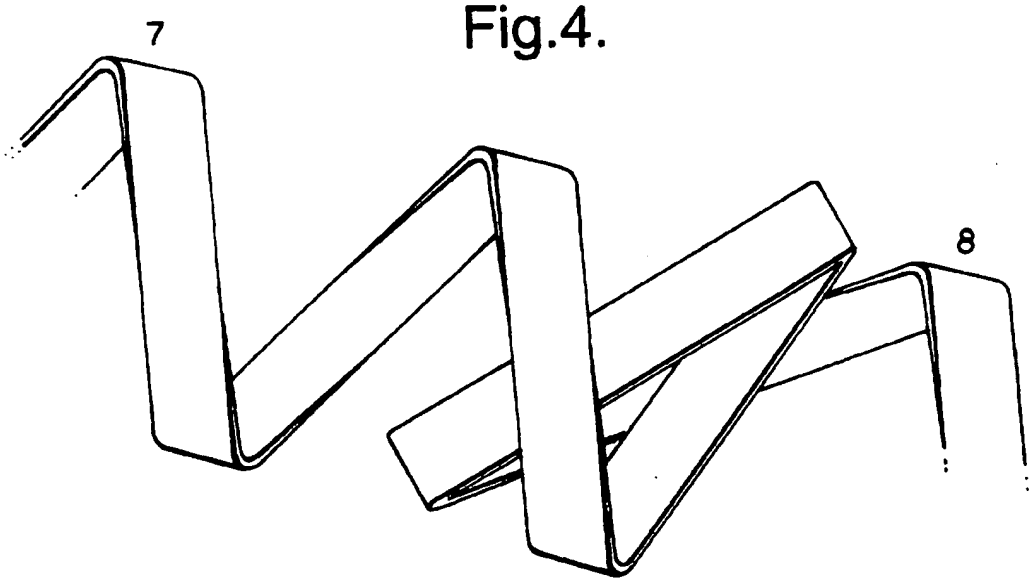
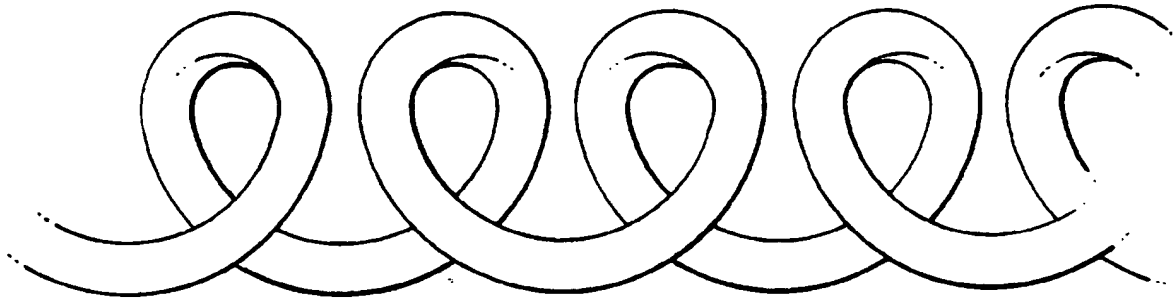


Fig.5.



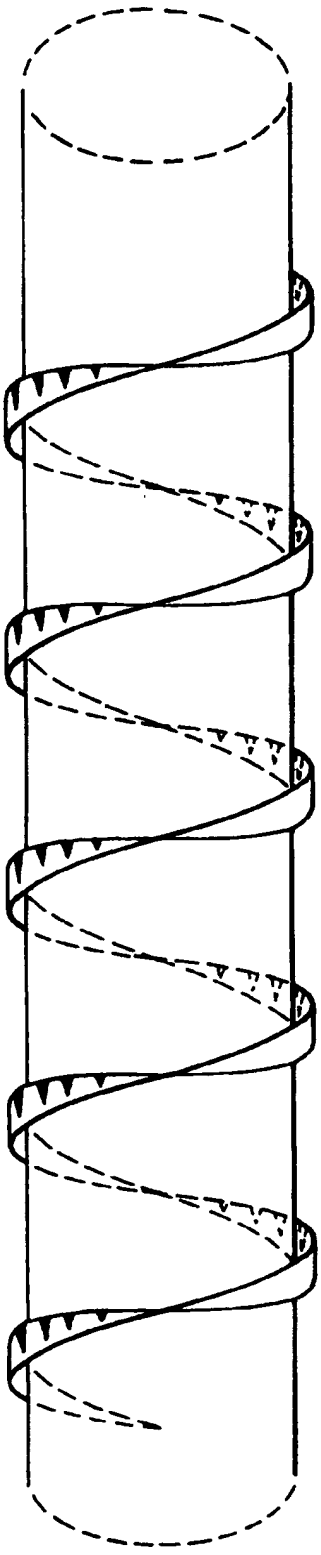


Fig.6.

INTERNATIONAL SEARCH REPORT

Inter nal Application No
PCT/GB 95/01663

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 H01B13/00 H01B7/06

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 H01B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US,A,2 452 431 (COLLINS) 26 October 1948 see column 1, line 17 - line 48; figures 1-11	1,5,9
A	DE,C,616 791 (PAETSCH) 5 August 1935 see claim 1; figure 4	1,4,6,8

☐ Further documents are listed in the continuation of box C.

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Name and mailing address of the ISA	Authorized officer
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US-A-2452431	26-10-48	NONE	
DE-C-616791		NONE	